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CLASTOPTERA ARBORINA: SEASONAL HISTORY AND HABITS ON ORNAMENTAL JUNIPER IN PENNSYLVANIA (HOMOPTERA: CERCOPIDAE)

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Abstract.—The seasonal history and habits of the spittlebug *Clastoptera arborina* Ball, often misidentified in the eastern United States as *C. juniperina* Ball, were observed in southeastern Pennsylvania on *Juniperus chinensis* cv 'Hetzii' during 1981–82. Overwintered eggs of this univoltine cercopid hatched in mid-May, and adults began to appear during mid-July. Notes on host plants and records of *C. arborina* from New York, North Carolina, and Tennessee are given.

Clastoptera arborina Ball, described from Iowa, has been misidentified in much of the subsequent literature as *C. juniperina* Ball. Hamilton (1978) showed that *C. newporta,* which Doering (1929) described as new from Connecticut, New Jersey, New York, and Rhode Island, is a junior synonym of *arborina.* For *C. arborina* sensu Doering, an undescribed species, Hamilton described *C. doeringae,* a cercopid found on *Juniperus* spp. from British Columbia to Arizona and New Mexico. *C. arborina* now is known from southern Ontario south to North Carolina and west to Iowa (Hamilton, 1982).

The scant biological information on *C. arborina* in eastern United States has been published under the name *C. juniperina,* a primarily Rocky Mountain species correctly interpreted by Doering (1929) (see Hamilton, 1978) [her eastern records of *juniperina* (District of Columbia, Massachusetts, West Virginia) were taken from Ball (1927) and probably are based on misidentifications]. Thus, Hanna and Moore (1966) and Hanna (1970) recorded *arborina* (as *juniperina*) from ornamental juniper in Michigan, noting that nymphs are present during June and July; adults, from July to September. Other brief references to the habits of "*juniperina*" that should be referred to *C. arborina* are those of Wilson (1977) in his guide to conifer insects of the Lake States and Wheeler et al. (1981) in a manual of juniper-associated arthropods of Pennsylvania.

In this paper the seasonal history and habits are presented for a population studied on ornamental juniper in southeastern Pennsylvania. Notes on host plants and additional distribution records are given, and development of *C. arborina* in Pennsylvania is compared with that in more northern (New York) and southern populations (North Carolina).

Methods

The seasonality of a large population of *C. arborina* was followed by sampling a hedge of Hetz juniper, *Juniperus chinensis* cv 'Hetzii,' in a nursery at Gwynedd

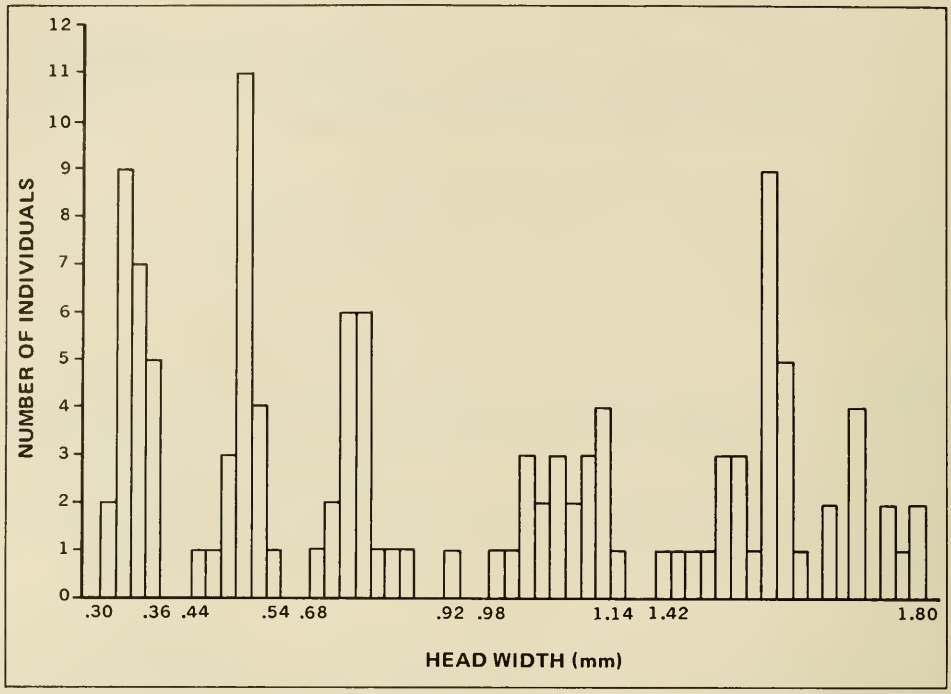

Fig. 1. Measurements of head capsules (greatest width across eyes, in mm) of nymphs of *Clastoptera arborina*.

Valley (Bucks Co.), Pennsylvania. Sampling began on 3 June 1981 when small spittle masses became apparent; the overwintered eggs, however, had hatched somewhat earlier because the population consisted mainly of second-instar nymphs. Each week from 3 June to 2 July, 10 twigs containing spittle masses were chosen at random, pruned from the hedge, and placed in 70% ethanol for later sorting. In the laboratory, head capsules of the first 10 nymphs examined (some spittle masses contained 2 nymphs) were measured (greatest width across eyes) to determine the stages present. Fig. 1, based on the measurements of 121 nymphs, illustrates the presence of 5 instars in *C. arborina*.

In 1982 the same sampling scheme was followed, and more careful early-season observations were made to determine the time of egg hatch. Nymphs were not found on 11 May, but first instars were present by 20 May. When fifth instars appeared (24 June), the hedge was sampled by beating branches over a small tray to determine the appearance of adults. Once adults were found, the relative proportion of late instars to adults was estimated. Late-season collections were made near the sample site and at other localities in Pennsylvania to determine how long adults are present. A sample of 10 nymphs also was taken on ornamental juniper at Ithaca, New York and at Charlotte, North Carolina.

Seasonal History and Host Plants

Eggs overwinter in the terminal shoots of juniper. They are laid singly (occasionally 2 are placed closed together) and inserted obliquely just beneath the

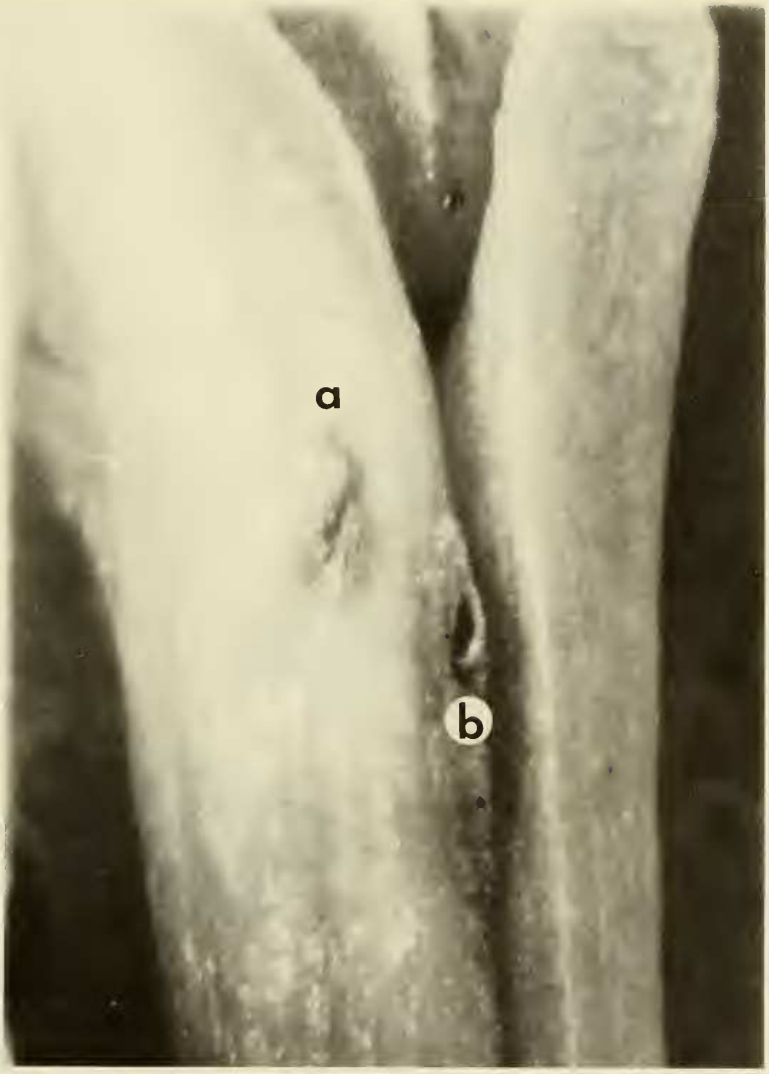

Fig. 2. Basal portion of juniper leaf and subjacent region on stem showing egg of *Clastoptera arborina* (a) and an oviposition site with egg removed (b).

epidermis of the current season's growth. The operculum is flush with the surface but visible externally; a brown necrotic area sometimes surrounds the oviposition site (Fig. 2). The egg, roughly ovoid, is about 0.40 mm wide and 0.80 mm long. Eggs excavated from juniper leaders collected in late March contained embryos lying within a hardened shell. A dark, scalelike egg burster, perhaps characteristic of *Clastoptera* spp. (see Hanna, 1969) or even cercopids in general (Hamilton, 1982), lies beneath the operculum.

Overwintered eggs begin to hatch in mid-May in southeastern Pennsylvania (Fig. 3). The first-instar nymphs settle on small twigs (2–3 mm diameter) of the terminal branches, with spittle masses often observed in twig axils within 1–2 cm

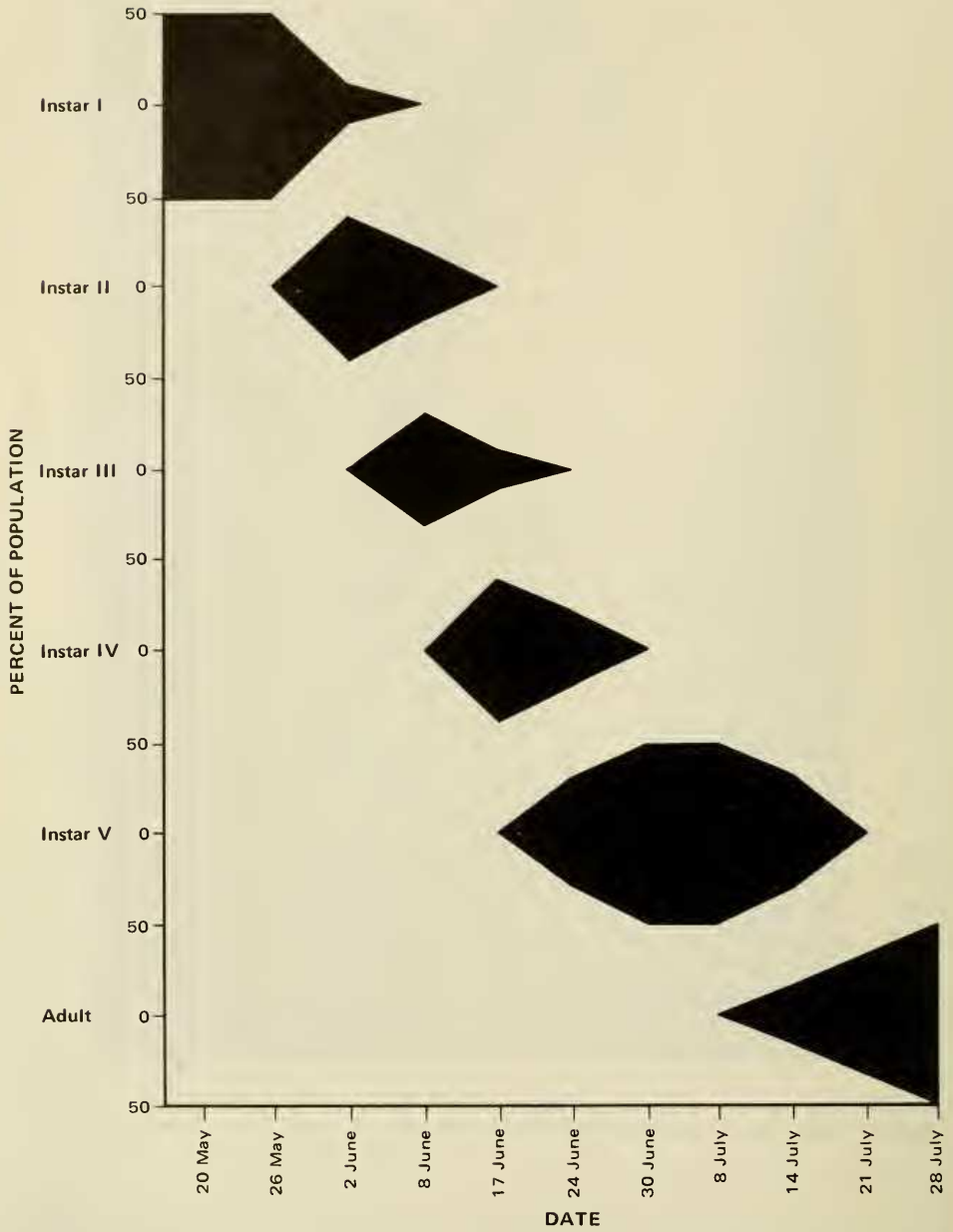

Fig. 3. Development of *Clastoptera arborina* on *Juniperus chinensis* cv 'Hetzii' in 1982 in southeastern Pennsylvania from time of first egg hatch to the appearance of adults. Overwintering eggs are not indicated.

of the tip. In the weekly samples second-instar nymphs were present by the first week of June (Fig. 3) and fourth instars, by 17 June. A few fifth-instar nymphs were found one week later, and the samples of 30 June and 8 July contained only nymphs of this stage. The first adults were taken on 14 July. An old spittle mass may persist on shoots as a whitish powder several weeks after the adult has

emerged. Seasonality was similar in 1981 except that populations developed slightly earlier. Fifth instars (3 of 15 nymphs collected) were observed on 18 June, and adults appeared by 2 July. Adults were common during mid-to late July and, although sampling was discontinued after July, collections at nearby localities indicate that adults of this univoltine species are present in small numbers through August.

A sample of 10 nymphs taken on 26 June at Ithaca, New York, contained mostly third instars with a few second and fourth instars present. Adults in this more northern population were collected as late as early September. At Charlotte, North Carolina, instars II–IV were found on 21 May with third instars predominating at this more southern locality.

C. arborina seems to develop the largest populations on ornamental junipers rather than on native eastern red-cedar, *Juniperus virginiana* L. In New York (Monroe and Tompkins Co.), North Carolina (Mecklenburg and Rockingham Co.), and Pennsylvania (Bucks, Dauphin, and Northampton Co.) it has been observed on *J. chinensis,* especially the cultivars 'Hetzii' and 'Pfitzeriana,' and on cultivars of *J. virginiana.* The large numbers of spittle masses sometimes seen on ornamental juniper may attract the attention of horticulturists, but the feeding of *C. arborina* does not cause obvious injury and does not appear to affect plant vigor. In Tennessee (Knox Co.) I have taken this cercopid on native red-cedar. In Michigan, this species has been collected on ornamental junipers and occasionally on arborvitae (*Thuja*), but it is not known to occur on native red-cedar (Hanna and Moore, 1966; Hanna, 1970).

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